Detailed Action

Response to Amendment

The amendment filed on June 27, 2011 has been entered. Claims 1-3, 5, 7 and 10 have been amended. In light of these and other changes, Examiner withdraws all previous objections and 112 rejections.

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

Claims 1-3, 10-11 and 13 are rejected under 35 U.S.C. 102(b) as being anticipated by Akutsu (JP2002039061A) in view of one of Smith (US 5,925,167), Conrad (US 6,030,181), Visser (US 5,672,322), Ohmi (US 6,896,490), Conrad (US 5,733,104) or Beyer (US 5,944,049).

Claim 1: Akutsu discloses a vacuum apparatus comprising a vacuum container (10, 11 or 12) having a gas inlet (paragraph 5, “inlet”) and a gas outlet (A2 of Figure 1); a high vacuum pump (16a) connected to said gas outlet of said vacuum container, wherein said high vacuum pump is configured to operate in a molecular flow region and depressurize the inside of said vacuum container or maintain the inside of said vacuum container in a depressurized state; a vacuum pump (7) of at least one stage connected

to a gas outlet of said high vacuum pump; wherein the last stage vacuum pump has an inlet pressure of 10 Torr or less (Drawing 4, at B1, which on page 10 of the English translation lays out a pressure of .6 Torr) and a compressor (19) connected to a discharge port of a last-stage vacuum pump of said at least one-stage vacuum pump without divergence, configured to aspirate all of the gases from the last-stage vacuum pump and depressurize an input side of said compressor (19 would perform as such).

It is quite possible, even likely, that the compressor of Akutsu could pressurize an output side of the compressor to more than atmospheric pressure; however, Akutsu appears to lack any explicit disclosure of this feature. Nevertheless, the prior art is replete with references about vacuum pump trains which involve a final pump that exhaust at or greater than atmosphere pressure. Smith discloses a compressor (27) which pressurizes gases at an output side to more than atmospheric pressure (col. 5, lines 15-20, Examiner notes that for the gases to be “passed to the atmosphere” the last vacuum pump/compressor, 27, must have an outlet pressure greater than atmospheric pressure). Conrad ‘181 (see col. 3, lines 5-9), Ohmi (see abstract), Beyer (see col. 3, lines 47-53), Conrad ‘104 (see abstract) and Visser (see col. 5, lines 42-44) additionally show vacuum pump trains with similar atmospheric exhaust pressures. It would have been obvious at the time the invention was made to a person having ordinary skill in the art to operate the exhaust of Akutsu in a manner as taught by one of Smith, Conrad (‘181 or ‘104), Beyer or Visser in order to maintain a flow direction that easily disposes of waste gases that otherwise would need to be kept in storage, which would prove costly.

Claims 2-3: Akutsu and one of Smith, Conrad '181, Ohmi, Beyer, Conrad '104 and Visser teach the limitations of claim 1, discussed previously. Akutsu also discloses a vacuum apparatus wherein the vacuum pump of at least one stage is a single-stage pump (Drawing 4, 7) number of vacuum pump stages is set to a plurality of stages (Drawing 4). While Akutsu does not disclose a vacuum pump of at least one stage with a multiple stages, Conrad '181 further teaches a vacuum pump of at least one stage having multiple stages (Fig. 1, Examiner considers the high vacuum pump as 2a, and chooses the vacuum pump having multiple stages as 2b and 2c). It would have been obvious at the time the invention was made to a person having ordinary skill in the art to employ a vacuum pump having multiple stages, to further reduce the power demand on any one stage pump.

Claim 10: Akutsu discloses a vacuum apparatus comprising a container to be depressurized having a gas inlet and a gas outlet (Drawing 4) and introduced with a gas in a supply amount smaller than a predetermined amount (Examiner notes that such an event occurs at the immediate start of the introduction of gas into the container); a first vacuum pump (16a) configured to operate in a molecular flow region and maintain for maintaining the inside of said container to be depressurized; a second vacuum pump (7) connected at a subsequent stage of said first vacuum pump, wherein the inlet to the second vacuum pump has an inlet pressure of 10 Torr or less (Drawing 4, at B1, which on page 10 of the English translation lays out a pressure of .6 Torr); and a compressor (19) connected to said second vacuum pump without divergence, wherein the compressor is configured to aspirate all of gases from the second vacuum pump.

It is quite possible, even likely, that the compressor of Akutsu could pressurize an output side of the compressor to more than atmospheric pressure; however, Akutsu appears to lack any explicit disclosure of this feature. Nevertheless, the prior art is replete with references about vacuum pump trains which involve a final pump that exhaust at or greater than atmosphere pressure. Smith discloses a compressor (27) which pressurizes gases at an output side to more than atmospheric pressure (col. 5, lines 15-20, Examiner notes that for the gases to be "passed to the atmosphere" the last vacuum pump/compressor, 27, must have an outlet pressure greater than atmospheric pressure). Conrad '181 (see col. 3, lines 5-9), Ohmi (see abstract), Beyer (see col. 3, lines 47-53), Conrad '104 (see abstract) and Visser (see col. 5, lines 42-44) additionally show vacuum pump trains with similar atmospheric exhaust pressures. It would have been obvious at the time the invention was made to a person having ordinary skill in the art to operate the exhaust of Akutsu in a manner as taught by one of Smith, Conrad ('181 or '104), Beyer or Visser in order to maintain a flow direction that easily disposes of waste gases that otherwise would need to be kept in storage, which would prove costly.

Claim 11: Akutsu and one of Smith, Conrad '181, Ohmi, Beyer, Conrad '104 and Visser teach the limitations of claim 10, discussed previously. Akutsu also discloses a vacuum apparatus wherein said first vacuum pump is a turbomolecular pump (paragraph 9) or a thread groove pump, and said second vacuum pump is a booster pump (paragraph 33).

Claim 13: Akutsu one of Smith, Conrad '181, Ohmi, Beyer, Conrad '104 and Visser teach the limitations of claim 1, discussed previously. Akutsu also discloses a vacuum apparatus wherein the vacuum pump connected to said compressor is a screw pump (paragraph 9).

Claims 1 and 10 are rejected under 35 U.S.C. 103(a) as being unpatentable over Gebele (US 5,228,838) in view of one of Smith (US 5,925,167), Conrad (US 6,030,181), Visser (US 5,672,322), Ohmi (US 6,896,490), Conrad (US 5,733,104) or Beyer (US 5,944,049).

Claim 1: In Figure 1, Gebele discloses a vacuum apparatus comprising a vacuum container (5) having a gas inlet (2) and a gas outlet (line to 15); a high vacuum pump (12) connected to said gas outlet of said vacuum container, wherein said high vacuum pump is configured to operate in a molecular flow region and depressurize the inside of said vacuum container or maintain the inside of said vacuum container in a depressurized state; a vacuum pump (9) of at least one stage connected to a gas outlet of said high vacuum pump; and a compressor (11) connected to a discharge port of the last-stage vacuum pump of said at least one-stage vacuum pump without divergence, configured to aspirate all of the gases from the last-stage vacuum pump and depressurize an input side of said compressor (11 would perform as such).

Examiner notes that while Gebele does not explicitly state that the last stage vacuum pump has an inlet pressure of 10 Torr or less, Gebele is clearly describing an apparatus which operates in this pressure range (Examiner notes the suction capacity of the pump train disclosed in col. 1, lines 43-44, which range is entirely less than 10

Torr). It would have been obvious to one having ordinary skill in the art at the time the invention was made to adjust operating parameters of the vacuum pump train such that the last-stage pump has an inlet pressure of 10 Torr or less, since it has been held that where the general conditions of a claim are disclosed in the prior art, discovering the optimum or workable ranges involves only routine skill in the art. *In re Aller*, 105 USPQ 233.

It is quite possible, even likely, that the compressor of Gebele could pressurize an output side of the compressor to more than atmospheric pressure; however, Gebele appears to lack any explicit disclosure of this feature. Nevertheless, the prior art is replete with references about vacuum pump trains which involve a final pump that exhaust at or greater than atmosphere pressure. Smith discloses a compressor (27) which pressurizes gases at an output side to more than atmospheric pressure (col. 5, lines 15-20, Examiner notes that for the gases to be "passed to the atmosphere" the last vacuum pump/compressor, 27, must have an outlet pressure greater than atmospheric pressure). Conrad '181 (see col. 3, lines 5-9), Ohmi (see abstract), Beyer (see col. 3, lines 47-53), Conrad '104 (see abstract) and Visser (see col. 5, lines 42-44) additionally show vacuum pump trains with similar atmospheric exhaust pressures. It would have been obvious at the time the invention was made to a person having ordinary skill in the art to operate the exhaust of Gebele in a manner as taught by one of Smith, Conrad ('181 or '104), Beyer or Visser in order to maintain a flow direction that easily disposes of waste gases that otherwise would need to be kept in storage, which would prove costly.

Claim 10: In Figure 1, Gebele discloses a vacuum apparatus comprising a container (5) to be depressurized having a gas inlet (2) and a gas outlet (line to 15) and introduced with a gas in a supply amount smaller than a predetermined amount; a first vacuum pump (12) configured to operate in a molecular flow region and maintain for maintaining the inside of said container to be depressurized; a second vacuum pump (9) connected at a subsequent stage of said first vacuum pump; and a compressor (11) connected to said second vacuum pump without divergence, wherein the compressor is configured to aspirate all of gases from the second vacuum pump.

Examiner notes that while Gebele does not explicitly state that the second vacuum pump has an inlet pressure of 10 Torr or less, Gebele is clearly describing an apparatus which operates in this pressure range (Examiner notes the suction capacity of the pump train disclosed in col. 1, lines 43-44, which range is entirely less than 10 Torr). It would have been obvious to one having ordinary skill in the art at the time the invention was made to adjust operating parameters of the vacuum pump train such that the second vacuum pump has an inlet pressure of 10 Torr or less, since it has been held that where the general conditions of a claim are disclosed in the prior art, discovering the optimum or workable ranges involves only routine skill in the art. *In re Aller*, 105 USPQ 233.

It is quite possible, even likely, that the compressor of Gebele could pressurize an output side of the compressor to more than atmospheric pressure; however, Gebele appears to lack any explicit disclosure of this feature. Nevertheless, the prior art is replete with references about vacuum pump trains which involve a final pump that

exhaust at or greater than atmosphere pressure. Smith discloses a compressor (27) which pressurizes gases at an output side to more than atmospheric pressure (col. 5, lines 15-20, Examiner notes that for the gases to be "passed to the atmosphere" the last vacuum pump/compressor, 27, must have an outlet pressure greater than atmospheric pressure). Conrad '181 (see col. 3, lines 5-9), Ohmi (see abstract), Beyer (see col. 3, lines 47-53), Conrad '104 (see abstract) and Visser (see col. 5, lines 42-44) additionally show vacuum pump trains with similar atmospheric exhaust pressures. It would have been obvious at the time the invention was made to a person having ordinary skill in the art to operate the exhaust of Gebele in a manner as taught by one of Smith, Conrad ('181 or '104), Beyer or Visser in order to maintain a flow direction that easily disposes of waste gases that otherwise would need to be kept in storage, which would prove costly.

Claims 1, 7-8 and 10 are rejected under 35 U.S.C. 103(a) as being unpatentable over Conrad (US 7,033,142).

Claim 1: Conrad discloses a vacuum apparatus comprising a vacuum container (2) having a gas inlet and a gas outlet; a high vacuum pump (3 or 4) connected to said gas outlet of said vacuum container, wherein said high vacuum pump is configured to operate in a molecular flow region and depressurize the inside of said vacuum container or maintain the inside of said vacuum container in a depressurized state; a vacuum pump (6) of at least one stage connected to a gas outlet of said high vacuum pump; and a compressor (8 or 9) connected to a discharge port of the last-stage vacuum pump of said at least one-stage vacuum pump without divergence, configured to aspirate all of

the gases from the last-stage vacuum pump and depressurize an input side of said compressor (8-9 would perform as such). Conrad also discloses a compressor which pressurizes gases at an output side to more than atmospheric pressure (see claim 1, “for compressing the gas to atmospheric pressure”; Examiner notes that in order for an exhaust flow to occur, the pressure would necessarily need to be above atmospheric pressure, so the “to atmospheric pressure” would necessarily mean "to a pressure a little above atmospheric pressure").

Examiner notes that while Conrad does not explicitly state that the last stage vacuum pump has an inlet pressure of 10 Torr or less it would have been obvious to one having ordinary skill in the art at the time the invention was made to adjust operating parameters of the vacuum pump train such that the last-stage pump has an inlet pressure of 10 Torr or less, since it has been held that where the general conditions of a claim are disclosed in the prior art, discovering the optimum or workable ranges involves only routine skill in the art. *In re Aller*, 105 USPQ 233.

Claim 7: Conrad discloses a vacuum apparatus comprising a container (2) to be depressurized having a gas inlet and a gas outlet; a first vacuum pump (3 or 4) configured to operate in a molecular flow region and maintain for maintaining the inside of said container to be depressurized; a second vacuum pump (6) connected at a subsequent stage of said first vacuum pump; a third vacuum pump (8) connected at a subsequent stage of said second vacuum pump; and a compressor (9) connected to said third vacuum pump without divergence, wherein the compressor is configured to aspirate all of gases from the third vacuum pump. Conrad also discloses a compressor

which pressurizes gases at an output side to more than atmospheric pressure (see claim 1, “for compressing the gas to atmospheric pressure”; Examiner notes that in order for an exhaust flow to occur, the pressure would necessarily need to be above atmospheric pressure, so the “to atmospheric pressure” would necessarily mean "to a pressure a little above atmospheric pressure").

Conrad discloses the claimed invention except for operating a last-stage pump at with an inlet pressure of 10 Torr or less. It would have been obvious to one having ordinary skill in the art at the time the invention was made to adjust operating parameters of the vacuum pump train such that the last-stage pump has an inlet pressure of 10 Torr, since it has been held that where the general conditions of a claim are disclosed in the prior art, discovering the optimum or workable ranges involves only routine skill in the art. *In re Aller*, 105 USPQ 233.

Claim 8: Conrad teaches the limitations of claim 7, discussed previously. Conrad further discloses a vacuum apparatus wherein said first vacuum pump is a turbomolecular pump (col. 1, lines 11-13) or a thread groove pump, and said second vacuum pump is a booster pump (col. 2, lines 63-65), said third vacuum pump being a dry pump (col. 1, lines 15-20).

Claim 10: Conrad discloses a vacuum apparatus comprising a container (2) to be depressurized having a gas inlet and a gas outlet and introduced with a gas in a supply amount smaller than a predetermined amount (Examiner notes that the receiver must have an inlet to introduce gases and that the introduced gases will necessarily be less than the a predetermined amount, the predetermined amount being the container

or apparatus which supplies the receiver, which will retain a portion, however small of the introduced gases); a first vacuum pump (3 or 4) configured to operate in a molecular flow region and maintain for maintaining the inside of said container to be depressurized; a second vacuum pump (6) connected at a subsequent stage of said first vacuum pump, wherein the second vacuum pump has an inlet pressure of 10 Torr or less (Examiner notes the suction capacity of the pump train disclosed in col. 1, lines 43-44, which range is entirely less than 10 Torr); and a compressor (8 or 9) connected to said second vacuum pump without divergence, wherein the compressor is configured to aspirate all of gases from the second vacuum pump. Conrad also discloses a compressor which pressurizes gases at an output side to more than atmospheric pressure (see claim 1, “for compressing the gas to atmospheric pressure”; Examiner notes that in order for an exhaust flow to occur, the pressure would necessarily need to be above atmospheric pressure, so the “to atmospheric pressure” would necessarily mean "to a pressure a little above atmospheric pressure").

Examiner notes that while Conrad does not explicitly state that the last stage vacuum pump has an inlet pressure of 10 Torr or less it would have been obvious to one having ordinary skill in the art at the time the invention was made to adjust operating parameters of the vacuum pump train such that the last-stage pump has an inlet pressure of 10 Torr or less, since it has been held that where the general conditions of a claim are disclosed in the prior art, discovering the optimum or workable ranges involves only routine skill in the art. *In re Aller*, 105 USPQ 233.

Claims 4, 9 and 12 are rejected under 35 U.S.C. 103(a) as being unpatentable over Akutsu (JP2002039061A) or Gebele (US 5,228,838) in view of one of Smith (US 5,925,167), Conrad (US 6,030,181), Visser (US 5,672,322), Ohmi (US 6,896,490), Conrad (US 5,733,104) or Beyer (US 5,944,049) and in further view of Maruyama (JP09321021) or Puech (US 6,644,931).

Claims 4, 9 and 12: Akutsu or Gebele and one of Smith, Conrad, Visser, Ohmi, Conrad or Beyer disclose the limitations of claims 1, 7 or 10. Akutsu or Gebele do not disclose a gas recovery apparatus configured to recover a gas discharged from said last-stage vacuum pump. However, Maruyama teaches a gas recovery apparatus (Drawing 5, 54 or 55; Drawing 1, 4, 5 or 10; Examiner notes that pump 4 or 54 could broadly be interpreted to be a gas recovery apparatus). It would have been obvious at the time the invention was made to a person having ordinary skill in the art to employ a gas recovery apparatus as taught by Maruyama into the apparatus of Akutsu or Gebele in order to separate out unnecessary byproducts from the exhaust air. Alternatively, Puech teaches a gas recycling apparatus (10) at the terminal end of the main and auxiliary pumps, 1 and 6, respectively. Independent of these pumps, Puech teaches that this recycling system “generates a recycled gas flow…directed via a recycling pipe to a controlled gas supply" (col. 5, lines 16-18). Such "generation" would necessarily come by way of an additional pump or compressor within the gas recycling apparatus. It follows, then, that it would have been obvious at the time the invention was made to a person having ordinary skill in the art to employ a gas recovery system as taught by Puech into the apparatus of Akutsu or Gebele in order to reuse gases, making

repurchase of costly gases unnecessary. As a further alternative, Smith further teaches a gas recovery apparatus (27 or 28) used to treat exiting gases. It would have been obvious at the time the invention was made to a person having ordinary skill in the art to employ a gas recovery apparatus as taught by Smith into the apparatus of Akutsu or Gebele in order to prevent harmful gases from escaping into the atmosphere.

Claims 4, 9 and 12 are rejected under 35 U.S.C. 103(a) as being unpatentable over Conrad (US 7,033,142) in view of Maruyama (JP09321021), Puech (US 6,644,931) or Smith (US 5,925,167).

Claims 4, 9 and 12: Conrad teaches the limitations of claims 1, 7 or 10. Conrad does not disclose a gas recovery apparatus configured to recover a gas discharged from said last-stage vacuum pump. Maruyama teaches a gas recovery apparatus (Drawing 5, 54 or 55; Drawing 1, 4, 5 or 10; Examiner notes that pump 4 or 54 could broadly be interpreted to be a gas recovery apparatus). It would have been obvious at the time the invention was made to a person having ordinary skill in the art to employ a gas recovery apparatus as taught by Maruyama into the apparatus of Conrad in order to separate out unnecessary byproducts from the exhaust air. Alternatively, Puech teaches a gas recycling apparatus (10) at the terminal end of the main and auxiliary pumps, 1 and 6, respectively. Independent of these pumps, Puech teaches that this recycling system “generates a recycled gas flow…directed via a recycling pipe to a controlled gas supply" (col. 5, lines 16-18). Such "generation" would necessarily come by way of an additional pump or compressor within the gas recycling apparatus. It follows, then, that it would have been obvious at the time the invention was made to a

person having ordinary skill in the art to employ a gas recovery system as taught by Puech into the apparatus of Conrad in order to reuse gases, making repurchase of costly gases unnecessary. As a further alternative, Smith further teaches a gas recovery apparatus (27 or 28) used to treat exiting gases. It would have been obvious at the time the invention was made to a person having ordinary skill in the art to employ a gas recovery apparatus as taught by Smith into the apparatus of Conrad in order to prevent harmful gases from escaping into the atmosphere.

Claim 5 is rejected under 35 U.S.C. 103(a) as being unpatentable over Smith (US 5,925,167).

Claim 5: Smith discloses a vacuum apparatus comprising a vacuum container to be depressurized having a gas inlet and a gas outlet (Fig. 2, 10-13); a high vacuum pump (14-17) connected to said gas outlet of said vacuum container, wherein said high vacuum pump is configured to operate in a molecular flow region and depressurize the inside of said vacuum container or maintain the inside of said vacuum container in a depressurized state; vacuum pumps of a plurality of stages (18-21) connected to said high vacuum pump (and exhausted either through 26 or pathway “D”); and a gas recovery apparatus (28) configured to recover a gas discharged from the last-stage vacuum pump of said vacuum pumps for re-use of said gas; wherein said vacuum apparatus further comprises a gas recovery compressor (27), connected to a discharge port of said last-stage vacuum pump without divergence, wherein said compressor is configured to aspirate all of gases from the last-stage vacuum pump and assist a depressurization operation of said last- stage vacuum pump and suppressing back

diffusion from said discharge port, and said gas recovery compressor serves as said gas recovery apparatus (Fig. 2). Examiner also notes that in an alternative interpretation, the gases exhausted through 18-21 may also exit along pathway "D" to a gas recovery apparatus (gases are "collectively or individually treated"). The figure lacks a compressor along the "D" pathway but Examiner suggests that a compressor, 27, could be incorporated just as 27 is utilized along exit route 26 to re-pressurize exit gases to increase the flow of gases to the recovery apparatus. In this context, it would have been obvious at the time the invention was made to a person having ordinary skill in the art to employ a gas recovery compressor disclosed in Figure 2 (27) to improve the exit flow of the exhaust gases exiting pathway D. In addition, Smith also discloses a compressor (27) which pressurizes gases at an output side to more than atmospheric pressure (col. 5, lines 15-20, Examiner notes that for the gases to be "passed to the atmosphere" the last vacuum pump/compressor, 27, must have an outlet pressure greater than atmospheric pressure)

Smith discloses the claimed invention except for operating a last-stage pump at with an inlet pressure of 10 Torr or less. It would have been obvious to one having ordinary skill in the art at the time the invention was made to adjust operating parameters of the vacuum pump train such that the last-stage pump has an inlet pressure of 10 Torr, since it has been held that where the general conditions of a claim are disclosed in the prior art, discovering the optimum or workable ranges involves only routine skill in the art. *In re Aller*, 105 USPQ 233.

Response to Arguments

Applicant's arguments filed June 27, 2011 have been fully considered but they are not persuasive. Applicant has amended the claims to require that an output side of a compressor be greater than atmospheric pressure. Examiner submits that such an arrangement is well known in the art, as evidenced by Smith et al. (see supra).

Conclusion

THIS ACTION IS MADE FINAL. Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the mailing date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to NATHAN ZOLLINGER whose telephone number is (571)270-7815. The examiner can normally be reached on Monday - Thursday, 9 a.m. - 4 p.m. EST.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Devon Kramer can be reached on 571-272-7118. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

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